TOP SECRET - CHESS

(6)

JOB NO. 78T04753A
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COMPARATIVE FILM PROCESSING STUDY

10-05-57
10-05-57

DOS ____ REV DATE 2 Jun 81 BY 063447
ORIG COMP 7 OPI 19 TYPE 11
ORIG CLASS T PAGES 25 REV CLASS S
JUST 22 NEXT REV 2012 AUTH: HR 70-2

10 MAY 1957

NPIC TCS-1414/57
(Comparative Film Processing Study)

Declass Review by NIMA / DoD

HTA - SPB
COPY NO. 1

TRANSMITTAL SLIP | DATE 30 July 1971

TO: ARCHIVES & RECORDS CENTER

ROOM NO. | BUILDING [redacted] 25X1A

REMARKS:

ATTN: [redacted] 25X1A

Buck this is probably the only existing copy of this report and the people here at the Center felt that it should be sent to ARCHIVES, rather than hold here in the historical collection. 25X1A

[redacted]

FROM:

ROOM NO. | BUILDING | EXTENSION

FORM NO. 241 REPLACES FORM 36-8 WHICH MAY BE USED. (47)
1 FEB 55

DOCUMENT RECEIPT | NOTICE | SIGN AND RETURN TO [redacted] REGISTRY | 30 July 71 | P21218 COURIER REC. NO. 25X1A

SENDER OF DOCUMENT(S): [redacted] REGISTRY | OFFICE 25X1A

DESCRIPTION OF DOCUMENT(S) SENT

DOCUMENT DATE	DOCUMENT NUMBER	COPY NO.	ATTACHMENTS	CLASS
	TCS-1414/57	1		TSC

RECIPIENT

ADDRESS OF RECIPIENT: Archives & Records Center Attn: Buck

SIGNATURE (ACKNOWLEDGING RECEIPT OF ABOVE DOCUMENT(S))

OFFICE | DATE OF RECEIPT

File 6-979

TCS-1414-57

INDEX

SCOPE

25X1C

25X1C

The following study has been prepared in an effort to determine the relative quality of processing techniques as conducted at [redacted] and Eastman Kodak in ~~Syracuse~~ Rochester, New York. To the extent of time available, the photographic laboratory and the Bureau of Standards facilities utilized multiple samples of material from all processing sites for analysis.

While the evaluation is intended to determine quality of existing processed film, certain conclusions have been drawn as to procedures which, if employed, may improve the quality of the final product.

METHODOLOGY

The basic concept has been to evaluate processed film from the 3 processing sites without regard to the problems imposed by time or local conditions. The time permitted for this study restricted the depth as to number of missions and the number and detail of tests conducted by the Bureau of Standards.

A first phase consisted of submitting negative materials from all 3 sites to the Bureau of Standards for determination of residual chemicals denoting the quality of washing and for evaluating an expected longevity. The resulting report is given in Appendix I.

The second phase of testing consisted of evaluating the contact prints and 4X enlargements from 5 missions from each of the 3 processing sites. An attempt was made to procure coverage over like areas or terrain under apparently similar conditions in order to provide uniform material.

The contact prints were prepared on Kodak 137 paper on the Log E printer. The "dodging" capability was not employed so as to provide a print closely resembling the original negative.

An individual evaluation of the material as to granularity, density and contrast was prepared individually by four persons and the averaged results are recorded in Appendix III.

The second phase was to procure samples of typical flaws in processing which appear with reasonable consistancy in various processing techniques. Sample prints are included.

A critique prepared by Eastman Kodak of flaws noted in various materials is given in Appendix II. While some of the items noted pertain to handling rather than processing of film, the report is included as received.

PROCESSING TECHNIQUES

The following is a brief discussion of the various methods used in the processing of aerial film.

25X1C [redacted]

The standard Airforce A-9 processor is used. This is a daylight continuous type film processor in which the film procedes continuously through the required steps and enters an Airforce dryer on completion of the final washing of the film. The developer currently in use is D-19 which requires the film to move at a rate of 4.5 feet per minute, with chemicals at a temperature of 70 degrees. The machine will take an 1800 foot roll of thin base film and contains sufficient chemicals for approximately the same footage. In case of mechanical failure from 75-100 feet of film is usually ruined. The equipment will process an 1800 foot roll of film in 6.7 hours.

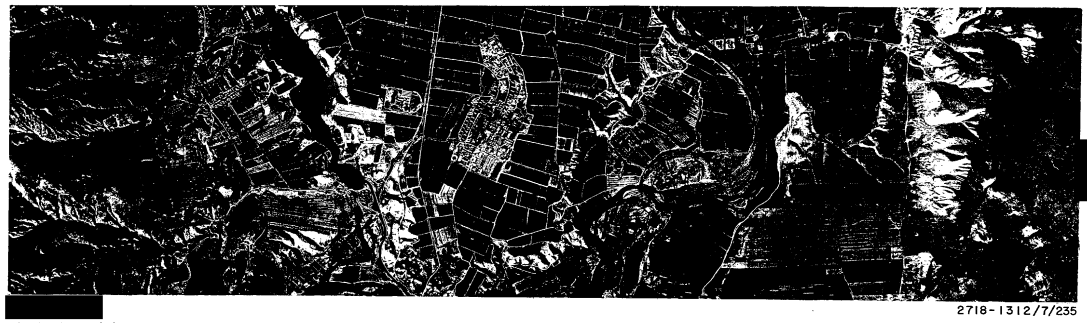
25X1C [redacted]

25X1A [redacted] utilizes the Zeiss FE-120 processor which closely resembles the Airforce B-5 equipment and consists of motor driven reels submerged in tanks approximately 12" wide x 30" long x 18" high. The reels hold approximately 400 feet of thin base film and are first prewet and then moved from tank to tank for the various processing steps and finally run thru the Airforce dryer. The film must be separated into 400 foot lengths and inserted into the reels. The present procedures utilize D-19 as the processing agent and the equipment will produce finished processed film at the rate of 8 feet per minute or 3.7 hours for each 1800 foot roll.

EASTMAN KODAK

The processing equipment is of the continuous dark room type. The material is given an initial processing which produces a definite image. The next step is to view the initial image under infra red light, which does not affect the chemical structure, and if necessary additional development is carried out. The equipment will handle up to 6500 foot rolls of thin base material. The equipment operates at a basic speed of 3-4 feet per minute which will require 7.5 to 10 hours per 1800 foot roll. On completion of final development the material is titled and cleaned prior to printing or duplicating. In general the chemicals resemble the former standard airforce photo chemical (line) developer (D-85) which is used in the first step. Specific information as to composition of the developer used in the secondary processing is not presently available.

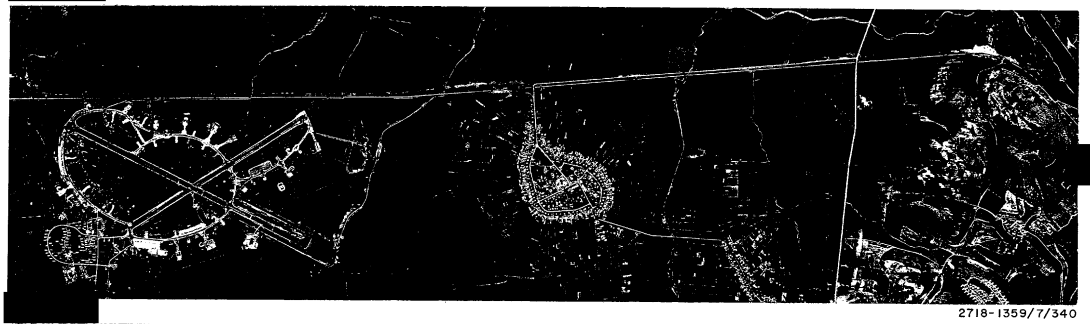
CONTACT PRINTS



2718-1312/7/235

25X1C

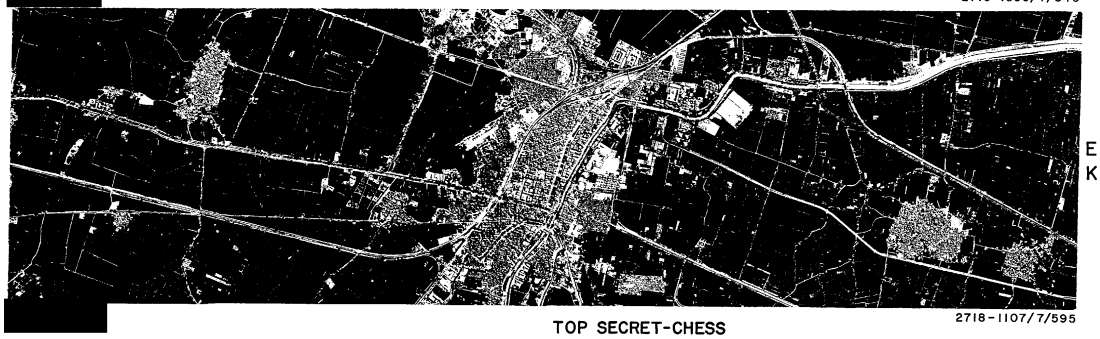
25X1D



2718-1359/7/340

25X1C

25X1D



2718-1107/7/595

E
K

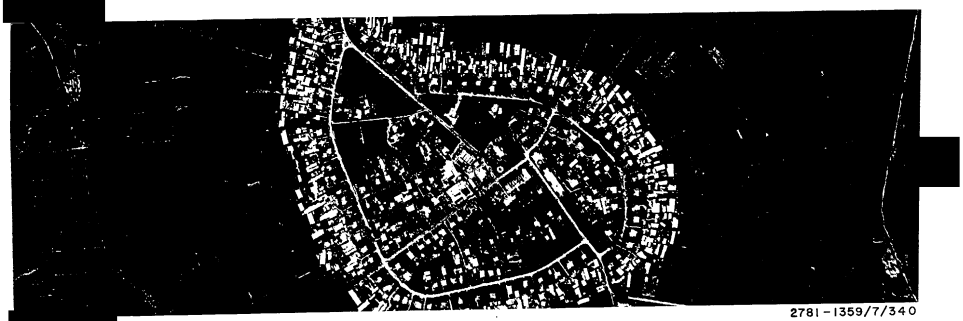
25X1D

4X ENLARGEMENTS

2781-1312/7/235

25X1C

25X1D



2781-1359/7/340

25X1C

25X1D

2781-1107/7/595

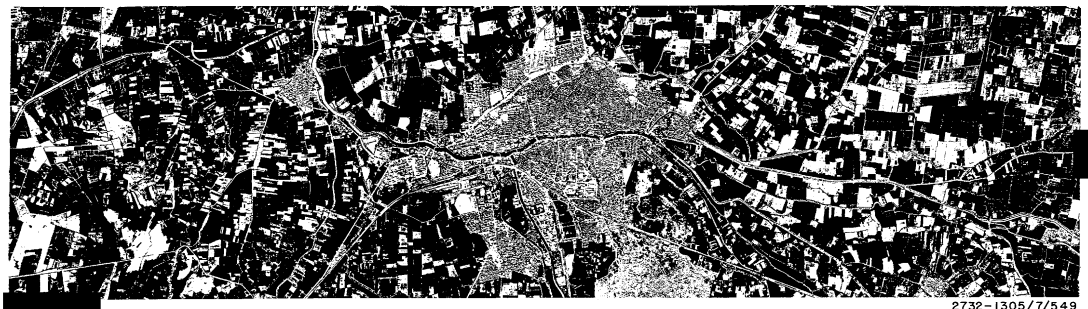
E
K

25X1D

5.

TOP SECRET - CHESS

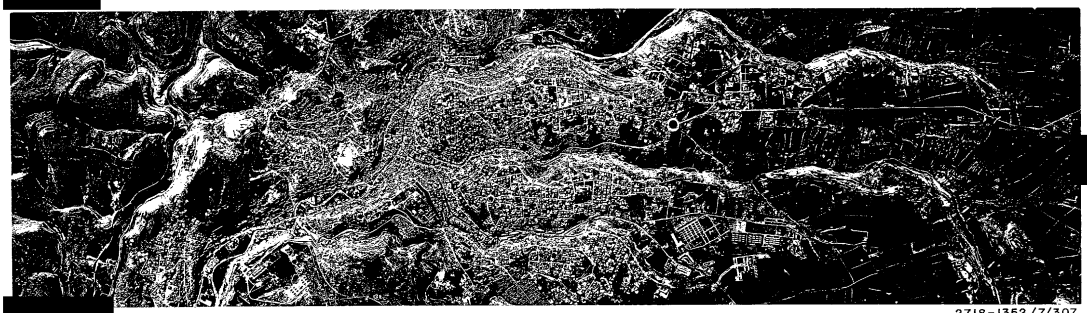
CONTACT PRINTS



2732-1305/7/549

25X1C

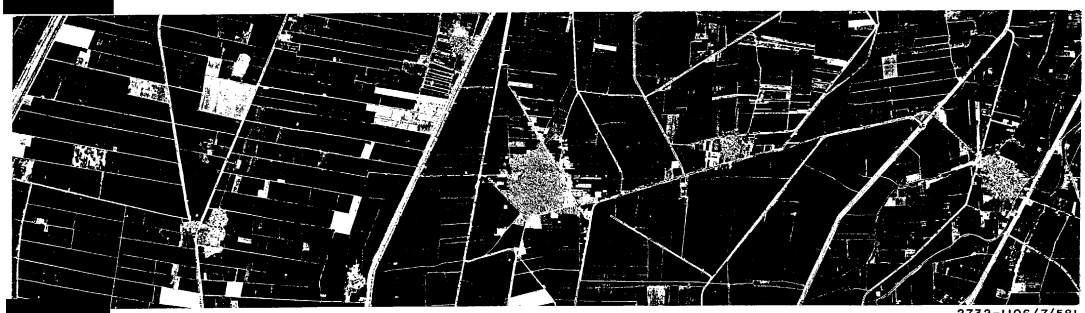
25X1D



2718-1352/7/307

25X1C

25X1D



2732-1106/7/581

E
K

25X1D

TOP SECRET - CHESS

TOP SECRET-CHESS

4X ENLARGEMENTS

25X1C

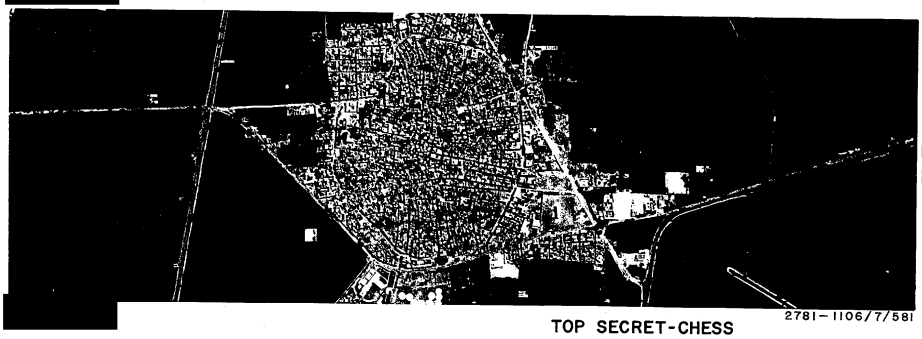
2781-1305/7/549

25X1D

25X1C

2769-1352/7/307

25X1D



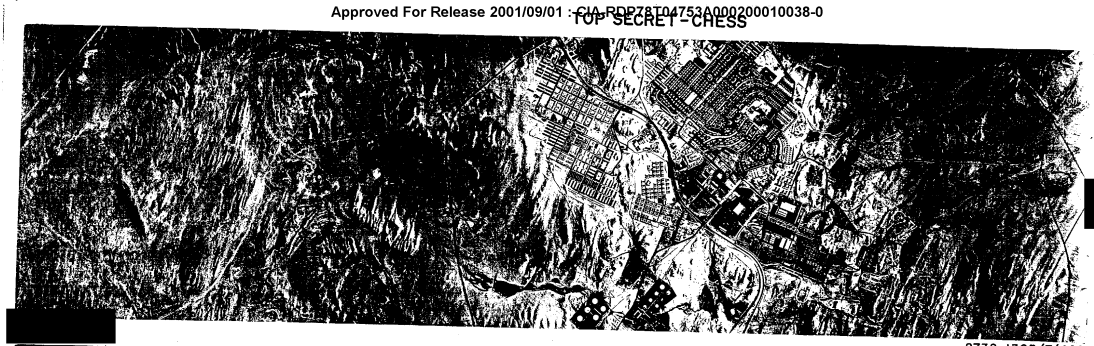
2781-1106/7/581

E
K

25X1D

TOP SECRET-CHESS

CONTACT PRINTS



2732-1325/7/408

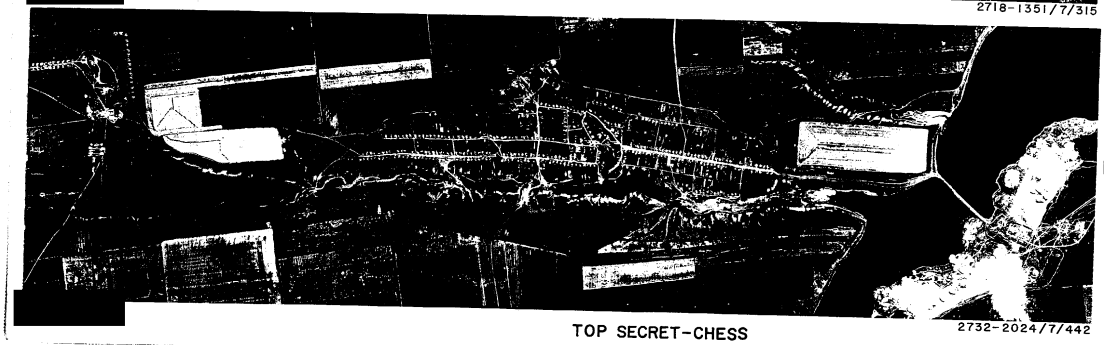
25X1C

25X1D

2718-1351/7/315

25X1C

25X1D

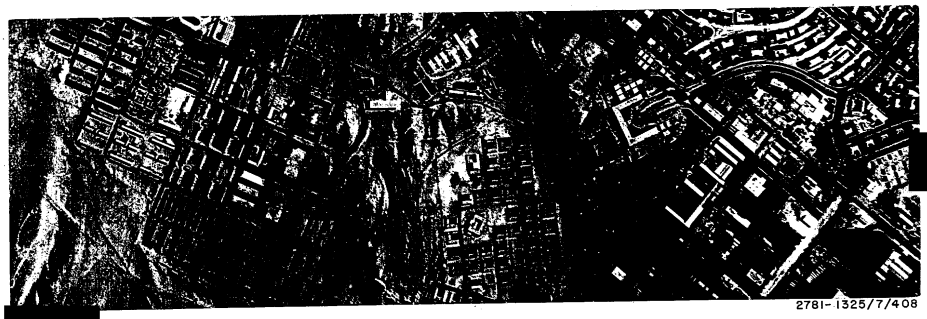


E
K

25X1D

2732-2024/7/442

4X ENLARGEMENTS



2781-1325/7/408

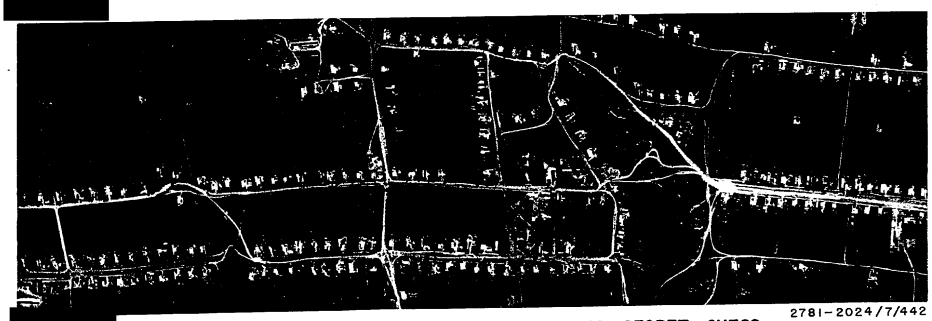
25X1C

25X1D

2781-1351/7/315

25X1C

25X1D

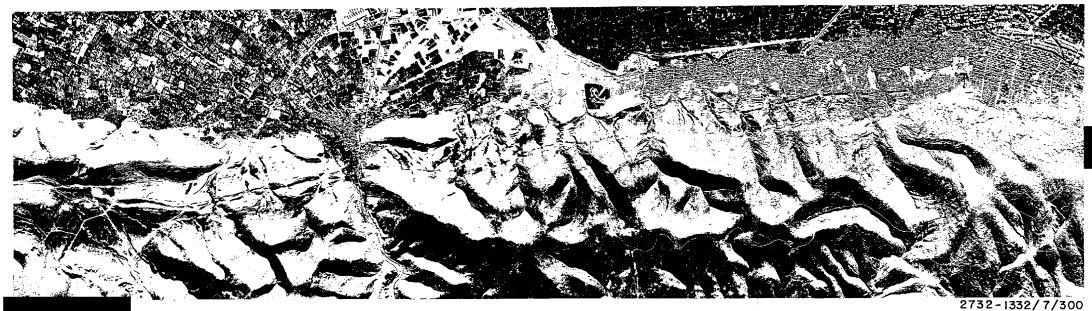


2781-2024/7/442

E
K

25X1D

CONTACT PRINTS



2732-1332/7/300

25X1C

25X1D

2732-1348/7/384

25X1C

25X1D

2732-1104/7/645

E
K

25X1D

4X ENLARGEMENTS

2781-1332/7/300

25X1C

25X1D

2781-1348/7/384

25X1C

25X1D

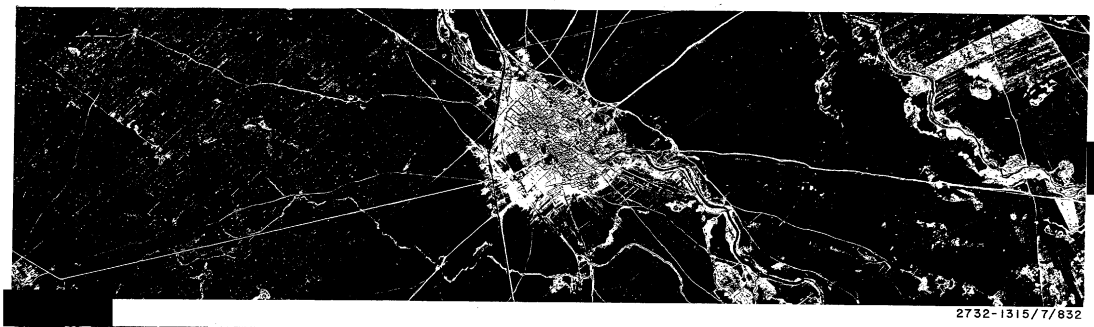
2781-1104/7/645

E
K

25X1D

CONTACT PRINTS

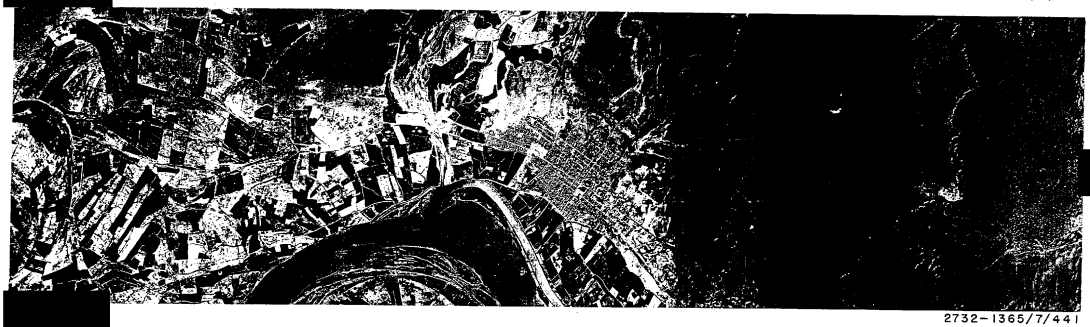
25X1C



2732-1315/7/832

25X1D

25X1C



2732-1365/7/441

25X1D

2732-1105/7/443

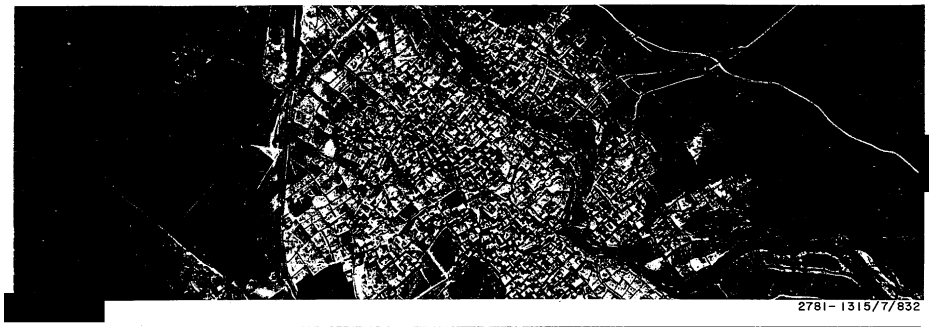
E
K

25X1D

TOP SECRET-CHESS

4X ENLARGEMENTS

25X1C



2781-1315/7/832

25X1D

25X1C

2781-1365/7/441

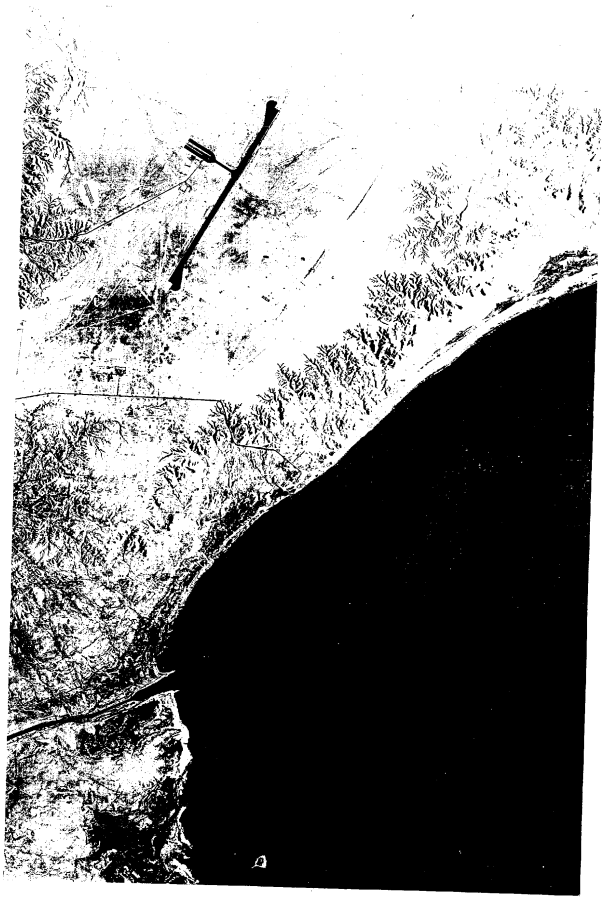
25X1D

2781-1105/7/443

25X1D

TOP SECRET-CHESS

1



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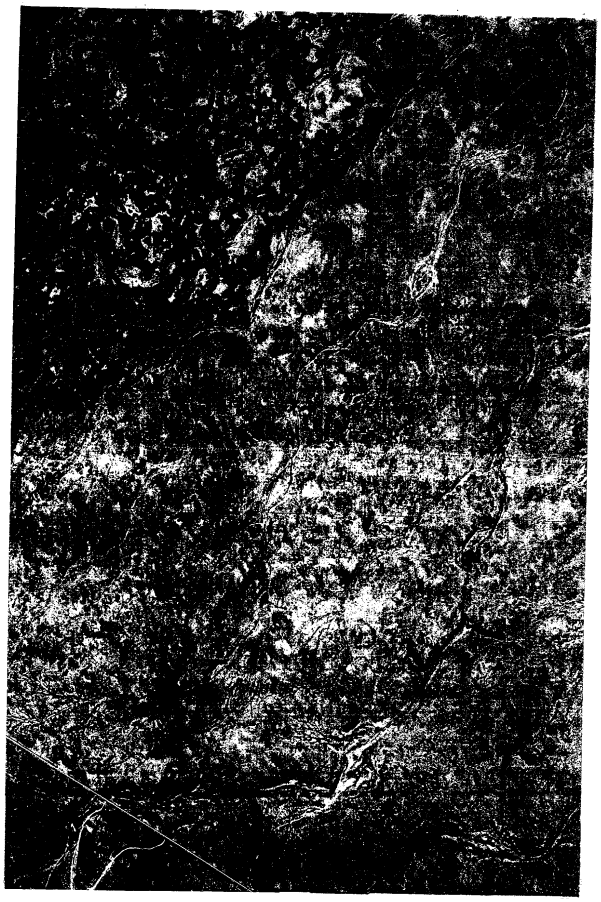

3

No. 1

Processing streaks consistantly found on material processed in Zeiss FE-120 processor utilized at [redacted] This is caused by failure to attach leader and tracker to the film prior to processing. 25X1C

No. 2

Water streaks caused by failure to remove excess water from film. This occurs frequently in the A-9 processor used at [redacted] 25X1C

No. 3

Gouges in emulsion caused by gritty material adhering to the rollers of the A-9 processor.

UNITED STATES DEPARTMENT OF COMMERCE
WASHINGTON

National Bureau of Standards

Report

of
Tests of Photographic Film
Reference A-6517

Fifteen samples of film were delivered by the liaison officer on May 2. The following tests were requested informally since there was no time to prepare a letter.

1. Milligrams of residual $(NH_4)_2 S_2 O_3$ per square inch
2. Milligrams of residual $Na_2S_2O_3$ per square inch
3. Probable permanence
4. Grain size.

It was not practical to differentiate between the ammonium and sodium thiosulfate in the quantities likely to be found in film so the residual thiosulfate was determined and calculated as sodium thiosulfate. (Note: Various nitrogen compounds may be present in the film, particularly if ammonia or ammonium compounds should be used in processing as is sometimes the case.)

A quantitative measure of grain size would be a time consuming task -- more in the nature of research than testing. Qualitative observations indicated that grain size was about the same in all samples and was of the magnitude indicated in the table.

25X1A [redacted]
A. T. McPherson
Associate Director

Table attached.

National Bureau of Standards
May 6, 1957

Results of Test of Film

Sample	Residual Hypo as $Na_2S_2O_3$ (mg. per sq. in.)	Probable Permanence	Grain Size
A-1	0.005	archival	Graininess is about the same in all samples and is similar to that of Super Panchro Press, and is not nearly as fine as photomechanical films such as Kodalith or microfilm.
A-2	.003	archival	
A-3	.003	archival	
A-11	.005	archival	
A-21	.008	could last many years	
B-1	.015	rewash*	
B-2	.005	archival	
B-3	.008	could last many years	
B-11	.03	rewash*	
B-21	.03	rewash*	
C-1	.000	archival	
C-2	.000	archival	
C-3	.000	archival	
C-11	.000	archival	
C-21	.000	archival	

Note

A Samples = [redacted]
B Samples = [redacted]
C Samples = EK

*probable life depends on density, conditions of storage, and other factors.

25X1C

Sample	Mission	Date	Sample	Mission	Date	Sample	Mission	Date
A-1	[redacted]		B-1	[redacted]		C-1	[redacted]	
A-2			B-2			C-2		
A-3			B-3			C-3		
A-11			B-11			C-11		
A-21			B-21			C-21		

25X1D
25X1D
25X1D

APPENDIX I.

Evaluation of Negative Film As Received Here

Processed in the Field

25X1D

[redacted]

Missing Frames

0197
0444

Process Trouble

Frame 49 to 52 Wrinkles
- Scratches throughout roll-
317-318 Wrinkles
320-321 "
322 "
414 to 417 "

Handling Marks

Frame 387
388

Troublesome Splicing Material

Frame 0196 and 0198 Red cloth type splice
" 0443 and 0445 " " " "

25X1D

[redacted]

Missing Frames

Part of 0097 missing
" " 376 "

Process Trouble

Frame 0026 Tears in middle of frame
28-29 Wrinkles
Process streaks from 97 to tail of roll.
209 Wrinkles
373 Pin holes
Scratch from head to 0475
Process streaks from tail to 656.

Troublesome Splicing Material

Frames 97-98 Tape splice between
376-377 " " "

Evaluation of Negative Film As Received Here

Processed in the Field

25X1D

[redacted]

Missing Frames

Part of 0211
" " 0223-0224

Handling Marks

Frame 0210
Thru entire roll

Process Trouble

Frame 0145-6-7 Pin holes
Head to 498 Drying Spots
Part 5 Light Creases

Troublesome Splicing Material

Frame 0211-0212 Tape splic
0212-0213 " "
0387-0388 " "
0496-0497 " "

L8

Missing Frames

Process Trouble

Frame 24 to 27 Creased Edge
35 Tear
34-35 Emul. Scratch
107 " "
197-200 Edge Wrinkles
634 " Tear
883-884 Bad Wrinkles
907-914 " "

Pin holes, wrinkles and scratches throughout entire roll.

Troublesome Splicing Material

217-218 Tape Splice
475-476 " "
623-624 " "

Evaluation of Negative Film As Received Here

Processed in the Field

25X1D

[redacted]

Missing Frames

227 Only part recd.
546

Process Trouble

222 to 226 Wrinkles
469 to 472 "
545 Creased
570 to 585 Wrinkles
800-801 "
827-829 "
Tail leader was not spliced on - this caused wrinkles and water spots.
256 to 266 Edge Wrinkles
515 to 524 " "

Handling Marks

570 to 585 Fingernail Marks
666 " "
800-801 " "
827-829 " "

Troublesome Splicing Material

202-203-204-205 Black tape splice removed
227-226 Black cloth "
546-545 Black tape "
676-6777 " "

25X1D

Evaluation of Negative Film As Received Here

Processed in the Field

[redacted]

Missing Frames

Only part 212 received

Process Trouble

Scratches throughout entire part.

Harding Marks

237 to 241 Fingernail marks

Troublesome Splicing Material

Frame 212-213 Black Tape Splice

V7

Missing Frames

Only part 138 received

Handling Marks

235-6-7
410 to 413

Process Trouble

Scratches head to tail

Frame 138 Wrinkles
139 Tear repaired with s.tape
253 Hand print
340 to 361 Crease near edge
139 to tail Roller marks

Troublesome Splicing Material

Frame 138 Black tape splice
255 " " "

L8

Missing Frames

Only part 234 received

Process Trouble

Scratches throughout roll.
0001-0002 Creases
383 to 391 Edge creases

Troublesome Splicing Material

234-235 Black tape splice

Evaluation of Negative Film As Received Here

Processed in the Field

25X1D

[redacted]

Missing Frames

Received only part of 199

Process Trouble

Part 1 Imbedded dirt
Scratches throughout
266 Imbedded dirt
478-487 Edge Wrinkles
Drying spots
Uneven development throughout roll.

Handling Marks

Frame 197
484-489
710-711
804

25X1D [redacted]

Missing Frames

Received only part of 180
" " " " 480

Process Trouble

Pressure marks throughout roll.
Very bad at tail end.

Frame 151	Creases
181	Wrinkles
234-235	Scotch tape
162-195	Uneven development
277	Creases-clear spots
278	Foreign substance on base side.
289	Creases
336 to 338	"
665	Drying spots

Handling Marks

Frame 181
289
328-333
336-338
444 to 463
478 to 481
524-527
534-535
540-541
548 to 554
594-595

Troublesome Splicing Material

Frame 181	Black tape splice
480	Scotch tape splice
626-627	" " "

25X1D [redacted]

Missing Frames

Parts of 235-236 missing
Part of 562 "

Process Trouble

Frame 36	Smudges
222 to 230	Creases
234	Scotch tape
255 to 257	Uneven drying
384-385	Imbedded dirt
437	Drying spot
438 to 445	Tear caused by drying spot
532	Edge tear
261 to 263	Digs

Handling Marks

Frame 132-133
134
222 to 230
234
255 to 257
261 to 263
325 to 330
561
643 to 645
651 to 655

Troublesome Splicing Material

Frame 235-236 Black tape splice

FILM AND PRINT EVALUATION

Unit	Date	Mission No.	Granularity*	Density	Contrast
[redacted] EK		[redacted]	1	1	1
			2	3	3
			2	2	2
[redacted] EK			2	3	1
			1	1	1
			3	2	2
[redacted] EK			2	2	1
			1	1	1
			3	3	2
[redacted] EK			1	1	2
			3	1	2
			2	1	1
[redacted] EK			1	1	1
			2	2	2
			1	3	1

The above sequence of ratings corresponds to the order in which the contact prints and enlargements appear in this study. The arrangement is primarily based on an attempt to group prints of similar areas and contrast. The ratings are relative and based on a comparison within each group of three. The rating of a number 2 for EK in the first group does not necessarily correspond to a rating of number 2 for [redacted] in the last group. Four separate evaluations were made by four individuals in arriving at the final rating.

The density and contrast has been determined by simultaneous inspection of the original negatives as well as the prints in the groupings shown above.

*The evaluation of granularity is based on a study of prints and the original negatives. The granularity is subject to such factors as frost, haze etc. all of which could not be thoroughly incorporated into this study.

SUMMARY

The tests conducted by HTA and summerized from Appendix III indicate the order of processing quality for the 3 sites as shown in the following table.

Granularity	Density	Contrast
[redacted] EK	[redacted] EK	[redacted] EK

As previously mentioned the time allotted was insufficient to allow incorporation of all data such as solar altitude etc.

A summary of the information provided by the Bureau of Standards indicates the following order of quality of the final processed material with regard to washing of the material.

Residual Chemicals
Remaining in Film

EK (zero quantity)

[redacted] (.005 mg/sq in.)

[redacted] (.017 mg/sq in.)

In conclusion it appears that the photographic qualities of material processed by [redacted] somewhat exceed those of Eastman Kodak while the processing techniques such as handling and washing employed by Eastman Kodak are superior to those employed in the field at [redacted]

RECOMMENDATIONS

The following recommendations are primarily for improving the handling and washing of photography at [redacted] 25X1C

[redacted] 25X1C

1. Conduct continuous preventive maintenance covering the following items:

A. Thoroughly clean before and after each operating period.

B. Thoroughly clean rollers of all grit and dirt to prevent scratching and gouging of the film which is very prevalent in A-9 processed material.

2. Maintain sufficient personnel for the number of machines in operation so that any malfunction may be dealt with rapidly and efficiently.

3. Maintain proper discipline in the use of gloves for handling of materials.

4. Use proper techniques and material for splicing of film.

5. Maintain proper proportions of chemicals in solutions and do not prolong their use.

6. Maintain proper speed and temperature at all times to provide the proper density.

7. Possible modification of equipment

[redacted] 25X1C

1. Splice leader on both ends of section to avoid processing streaks. All splices must be extremely accurately made.

2. Insure proper proportions of all chemicals.

3. Increase washing period.

4. Maintain proper discipline in use of gloves for handling of film.

5. Continually conduct preventive maintenance of equipment.